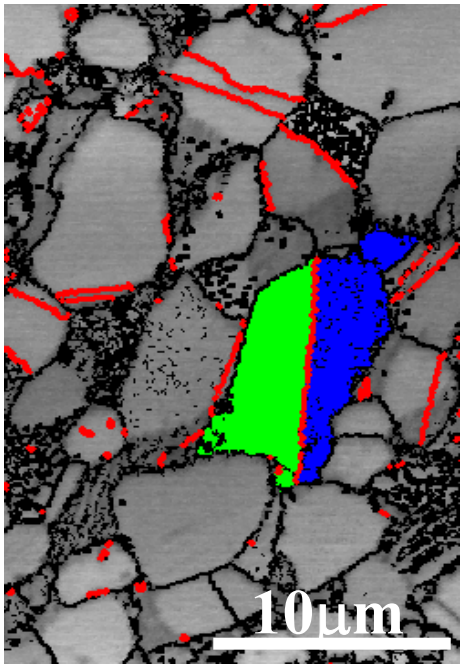
Grain Boundary Engineering of High Temperature Structural Alloys

Carl J. Boehlert, Alfred University, DMR-0134789

- Through controlled thermomechanical processing treatments, Grain Boundary Engineering of High Temperature Ni-based Superalloys and Ti-Al-Nb alloys can be achieved where the misorientations at the grain boundaries can be altered systematically.

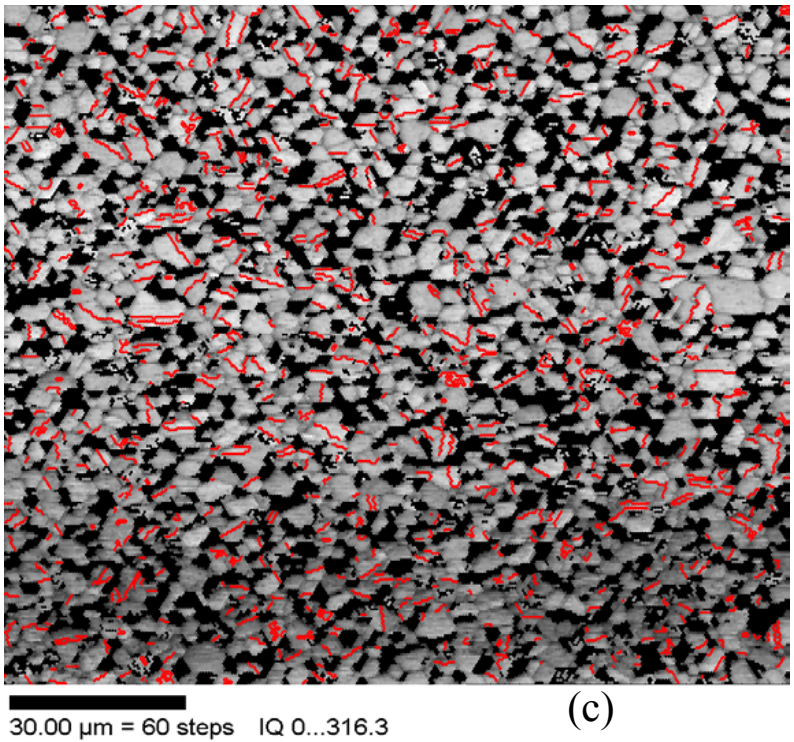
- This can significantly influence the elevated-temperature creep deformation behavior.



The (a) Orthorhombic (O) phase twin-related variant interfacial plane and the (b) corresponding (001) and (110) pole figures taken for a Ti-23Al-27Nb(at.%) alloy. The coincident points from the twin-related orientations are circled on the pole figures, which were used to identify the interfacial plane, (110), and the orientation, 64.4° about [001]. All such twin-related boundaries are indicated in red for the microstructure below (c).

- The {110} boundary plane twin variants, characterized by an ~64.4° rotation about [001], represented up to 28% of the O-phase boundaries, and 5% of the O boundaries exhibited {130} planes and were associated with an ~54.6° rotation about [001]. Thus 1/3 of all O-boundaries were twin related.

- Results suggest manipulation of the O-phase transformation variant boundaries may provide fertile ground for Grain Boundary Engineering in Ti-Al-Nb alloys.



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Scanning Electron Microscopy Education (SEMED) Outreach Program

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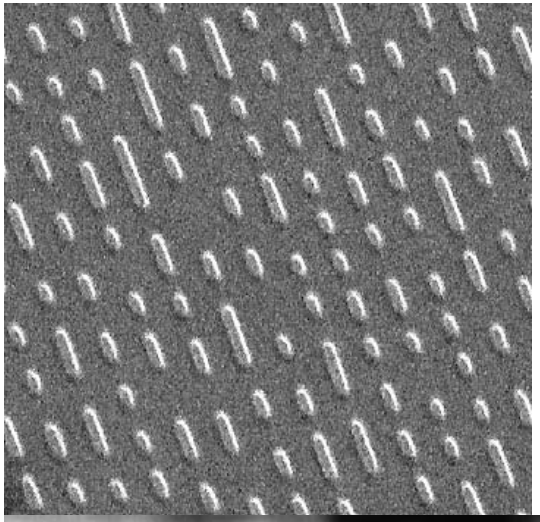
Educational/Outreach Activity:

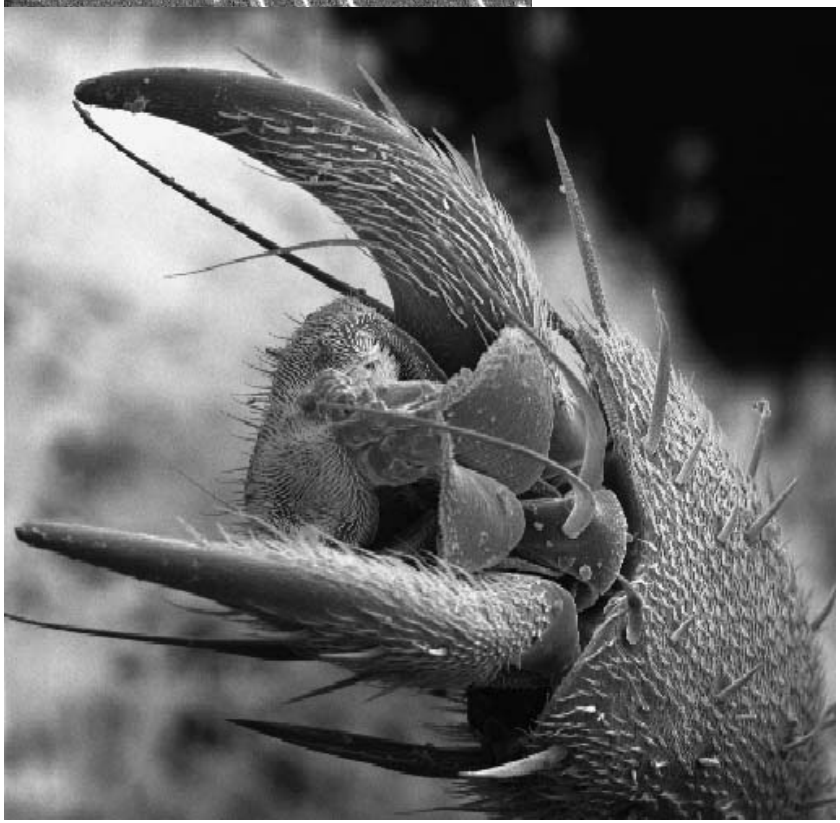
The goal of this program is to educate non-majors, high school students, and teachers about Materials Science and Engineering (MSE). The program is based on Scanning Electron Microscopy (SEM) education and involves hands-on instruction in use of a SEM. As it is designed to stimulate the students' interest in a MSE career, a variety of materials systems are evaluated including biomaterials, ceramics, metals, and whatever the high-school students may be interested in examining. Graduate and undergraduate students are involved in teaching the students SEM techniques and theory. The program is assisted by the Alfred University ASM/TMS Joint Student Chapter and is also offered to students not majoring in materials science who gain a greater knowledge and appreciation of what MSE entails.

In its first year, over 55 local school students have been taught hands-on by Alfred University volunteers, including faculty, staff, graduate and undergraduate students. The students then return to the program to perform a project for their high school science classes on samples they have prepared.

Visit http://semed.alfred.edu for details and to see some of the interesting posters the high school students have constructed.



Compact Disk(CD)



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